Imaging planet-forming disks: space-born coronagraphy and ground-based polarimetric differential imaging

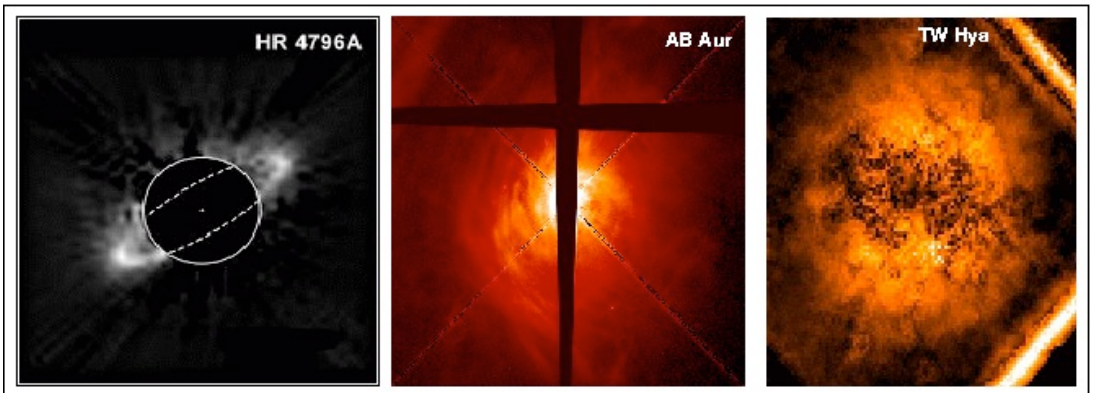
Daniel Apai
Steward Observatory, Dept. of Astronomy
The University of Arizona
933 N. Cherry Avenue, Tucson, AZ-85718
USA
apai@as.arizona.edu

The frequency of habitable planets throughout the Galaxy is regulated by the physics which transforms the massive circumstellar disks - residuals of the stellar birth - into planetary systems. Our most direct tool in the study of planet-forming disks is high-resolution imaging. This provides information on the disk evolution and reveals its structure, such as rings, gaps, and warps - clues on planets in formation.

I will briefly review the observed properties and evolution of protoplanetary disks based on the most relevant results from Hubble Space Telescope coronagraphic imagery. This technique is a unique tool for study of disks in the scales of our outer Solar System, but - due to the coronagraphic mask - it is inherently "blind" for disk regions corresponding to our inner Solar System.

I will also present a complementary new technique that overcomes this limitation by suppressing the bright stellar light while preserving the light scattered from the dust grains in the disk. By applying this technique on the Very Large Telescope and its adaptive optics system NACO, we probed the face-on disk around a nearby young star closer to the star than it was possible with any other imaging technique. Our measurements demonstrate that the circumstellar disk of TW Hya extends inward as close as 6 astronomical units to the star, very close to the gap predicted to be opened by a giant planet in formation.

I will show the future potential of these two complementary techniques and their relevance in the preparation of future space-based planet finding missions.



NASA, Smith, Schneider et a. NASA, Grady et al. Apai et al.